Working with Images

Version 1.0

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Rules for Rendering Images on the IDWR ArcIMS Server

Rule #1 – Don't display an image at a scale that would cause more than one pixel from the image to be drawn at the same place on the screen. Violating this rule wastes time. The server spends time reading and writing data that will never be seen.

Rule #2 – Don't display an image at a scale that would cause too many pixels to be drawn on the screen for a single pixel from the image. Violating this rule makes the display look too "pixelated." This rule should be broken only when the user might want to count pixels in the image.

Rule #3 – The map service should serve jpg-format images when natural images, such as satellite images or aerial photographs are used.

Rule #4 -- The map service should serve gif-format images for map services that show thematic maps or those containing only points, lines and polygons, without background images.

The amount of information displayed for a given map scale varies depending on the size and resolution of the user's screen. Photo-editing software packages use 72 or 96 dpi (pixels per inch) for normal screen resolutions. The table shows typical resolutions used for a range of monitors. Use 96 pixels per inch in calculations.

Monitor Size	Displayable Size	Number of Pixels Horizontal	Number of Pixels Vertical	Effective Resolution (pixels per inch)
15"	14"	800	600	71
17"	16"	1024	768	80
19"	18"	1280	1024	91

Example: Displaying the LANDSAT mosaic of Idaho.

Each pixel represents 171 meters.

Using rule #1: Determine the scale which represents the image displayed on-screen at 96 pixels per inch.

$$\frac{96\,pixels_s}{1inch} * \frac{39.37inches}{1meter} = 3780\,\frac{pixels_s}{meters_i}$$

Multiplying this value by the image resolution yields a dimensionless number that is the map scale denominator.

3780 * 171 meters/pixel = **646,380**

Using rule #2: Determine the scale which represents the image displayed drawing no more than three pixels on screen for every pixel in the image.

$$\frac{96\,pixels_s}{1inch} * \frac{39.37inches}{1meter} * \frac{1pixel_i}{3\,pixels_s} = 1260\frac{pixels_i}{meters_i}$$

Multiplying this value by the image resolution yields a dimensionless number that is the map scale denominator.

1260 * 171 meters/pixel = **215,460**

Allow the 171 meters/pixel image to be displayed between 1:646,380 and 1:215,460.

If you display 10-meter satellite data using the same rules, the image should only be displayed between 1:37,800 and 1:12,600.

Note: The ScaleFactor displayed at the bottom of ArcIMS web-map frames is the number of map units (in this case meters) per pixel currently being displayed. So, in the case of 171-meter pixels, the image would look the best when the scale factor is 171 and would be too "pixelated" beyond a scale factor of 57.

Using Tiled Images

This documentation explains the use of tiled GIF-format images for displaying thematic images using ArcIMS.

Using GIF Images to Display Thematic Data

(SEBAL-derived Evaporanspiration, or ET)

The ArcIMS project which serves the SEBAL-derived ET images on the web must be able to display each of the four monthly ET images, as well as a cumulative ET image and the LANDSAT Thematic Mapper background image. Those six images, in MrSid format, total 86 MB. The MrSid images are distorted and fuzzy when shown at a scale at which would allow the user to count pixels. The application must be designed so that only one of the monthly, cumulative or TM images will be displayed at a time.

GIF-format images are well suited for storing compressed thematic images. GIF provides good compression without any distortion or loss of information. Because of the way in which the GIF algorithm works, GIS is not the proper compression scheme to use for raw satellite data or digitized aerial photos.

For the ET ArcIMS application, the Bear Lake, Malad, Pocatello and Soda Springs quads will be used for testing; they cover a large portion of the area represented in the ET images. The cumulative ET images clipped to those four quads, formatted as uncompressed TIFFs use 19.4 MB of disk space. Those quads, converted to GIFs, use 3.5 MB.

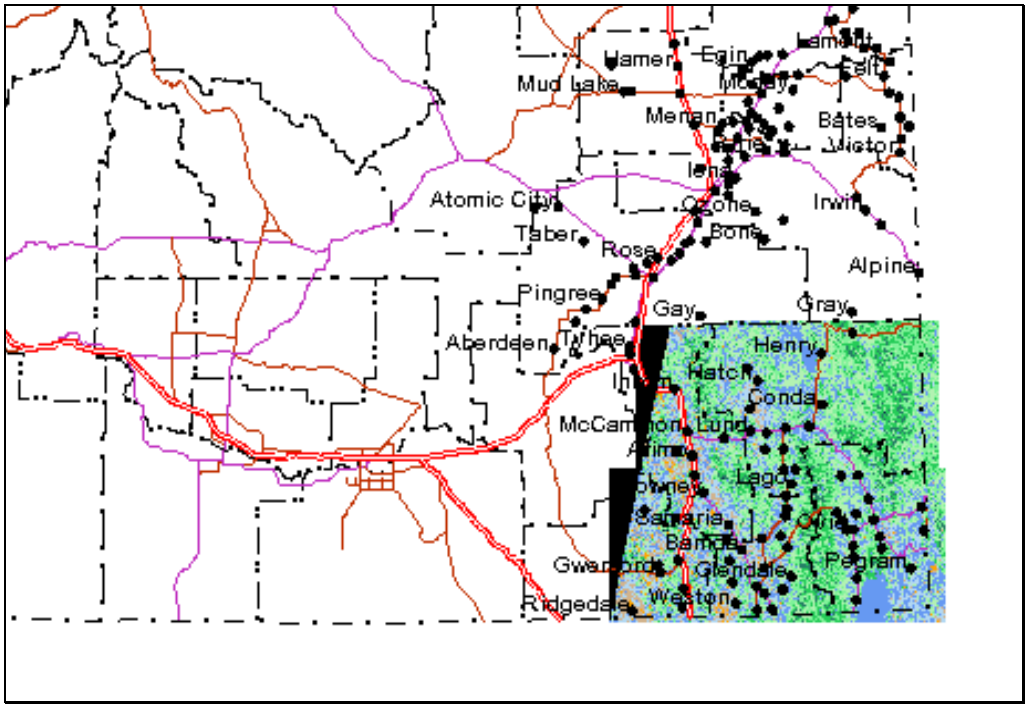
The following figure shows how to use an image catalog to serve all of the images in a directory. Because of the current limitation of the image catalog, isolate image formats. All of the images in the ..\SEBAL_ET\GIF directory are GIF.

Excerpt from ET.axl

```
<WORKSPACES>
  <IMAGEWORKSPACE directory="F:\GISImagery\ArcIMSData\SEBAL_ET\GIF" name="jai_ws-0" />
</WORKSPACES>
<LAYER type="image" name="ET Images" visible="true" id="0">
  <DATASET name="*ImageDirectory" type="image" workspace="jai_ws-0" />
</LAYER>
```

By using tiled images, assuming the Pocatello quad fully contains the entire area requested, the actual amount of data read by the spatial server is reduced from 19.4 MB to 498 KB -- less than three percent.

Images served with Image Catalog	Size (bytes)	% of tiled image
et100ks.gif	1,223,045	35
et24_mala100k.gif	691,070	20
et24_poca100k.gif	498,427	14
et24_soda100k.gif	1,083,266	31



Temporary Image	Description	Image Size (bytes)	Image Retrieval Time (seconds)	Total Request Time (Seconds)
ET_A105414683.gif	blank, white	1779	0.0	0.25
ET_A105419876.gif	the image shown above	20,960	2.297	3.218
ET_A105414684.gif	overlay map	1674	1.641	2.344
ET_A105419877.gif	small portion of BEAR quad -- no other layers visible -- ScaleFactor=19.359	49,326	0.781	1.594

ET_A105419877.gif represents 35% of the total size of the ET images and it takes 0.781 seconds -- 34% of the time used to render all four images. So, this proves that "image-tiling" renders a small portion of the map by reading only the necessary tiles.

Notice that the overlay map took a great deal of time to render, most of which can be attributed to the images. **Do not use images in the overlay map**. Use the map service named "overlaymap".